



ASSEMBLY — 39TH SESSION

TECHNICAL COMMISSION

Agenda Item 34: Aviation safety and air navigation policy

CHINA'S STRATEGY FOR MODERNIZING AIR TRAFFIC MANAGEMENT

(Presented by the People's Republic of China)

EXECUTIVE SUMMARY

This paper presents an overview of China's air traffic management system, its development trends, challenges and the main contents of China's Strategy for Modernizing Air Traffic Management (CAAMS).

Action: The Assembly is invited to take note of and discuss the information provided in this paper and recommend that ICAO incorporate the CAAMS into its global air traffic management planning system and pay continuing attention to the matter.

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| <i>Strategic Objectives:</i> | This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives. |
| <i>Financial implications:</i> | |
| <i>References:</i> | Doc 9854, <i>Global Air Traffic Management Operational Concept</i> Doc 9750, <i>Global Air Navigation Plan</i> |

¹ Chinese version provided by China.

1. INTRODUCTION

1.1 In 2015, the Chinese civil aviation industry registered a total traffic volume of 85 billion ton/ kilometers, carrying 440 million passengers and 6.3 million tons of cargo and mail, occupying the second place in the world for the 11th consecutive year and becoming the second largest global air transport system, with a transport fleet of 2645 aircraft and a network of 206 airports, of which 8 having an a throughput of over 30 million people and 25 of more than 10 million people per annum.

1.2 Also in 2015, the CAAC air traffic management system provided reliable support for 7.79 million take-offs and landings of international as well as domestic flights, an increase of 5.41% over the same period in the previous year. The rate of incidents caused by factors of air traffic control was as low as 0.00257 per 10 thousand flights. Over the last five years, China's air traffic management system invested an accumulated amount of RMB 12 billion yuan in building up the system, representing an annual increase of 20%.

1.3 It is estimated that by 2020, the Chinese civil aviation industry will boast of a transport fleet of 4600 aircraft flying 13 million flights, carrying 720 million passengers. General aviation operations will reach a total of 2 million hours. In addition to airports in Beijing, Shanghai and Guangzhou which are well on their way to becoming the world's busiest airports, airports in Shenzhen, Chengdu, Kunming, Chongqing, Xi'an and Urumqi will also be experiencing rapidly growing traffic.

2. DEMAND AND PLANNING

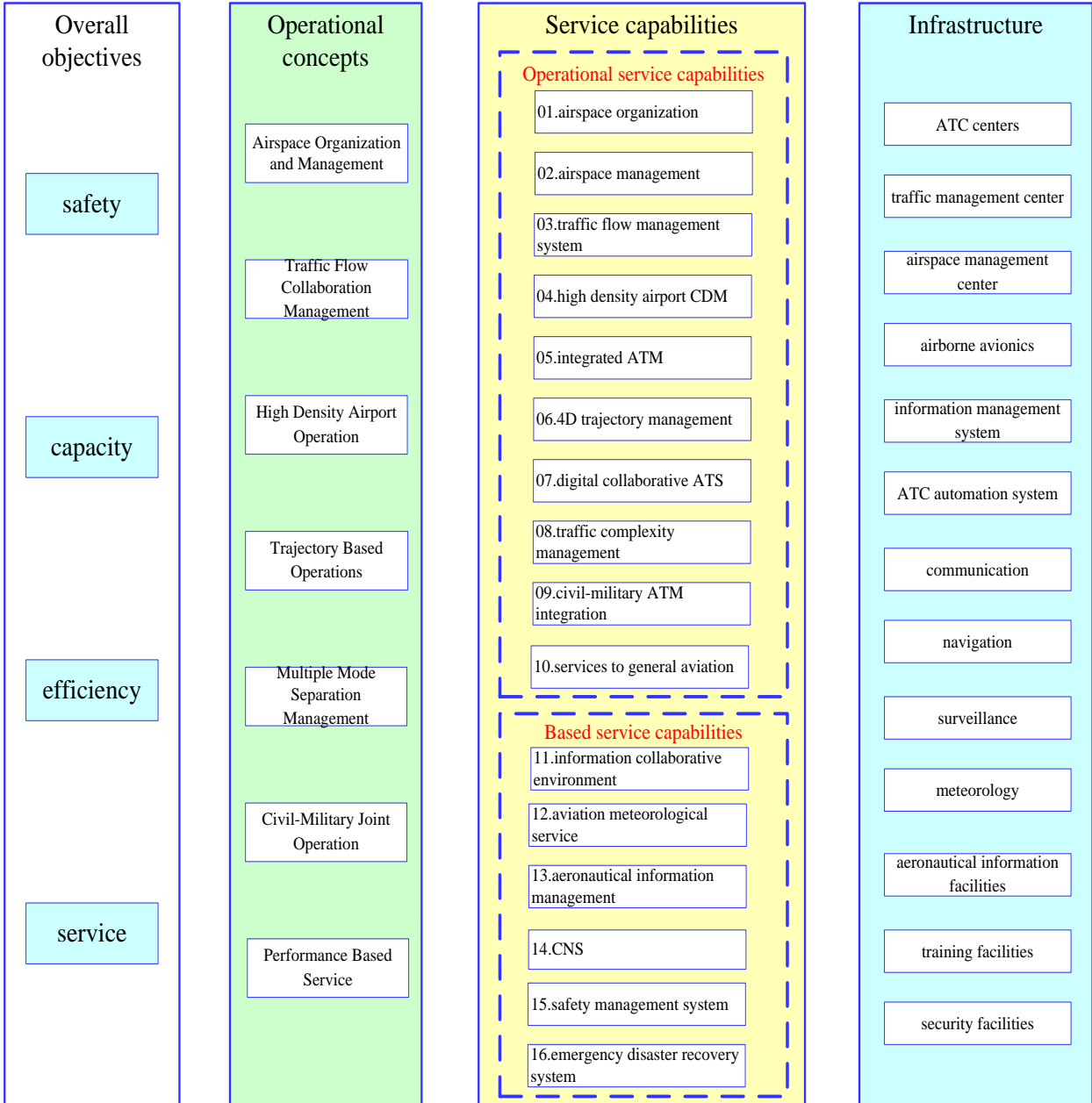
2.1 In the foreseeable future, the aviation market of China will continue to witness strong demand, the civil fleet will keep expanding and the number of airports increasing, posing enormous challenges to the air traffic management system. It is therefore necessary for us to accelerate the implementation of China's Strategy for Modernizing Air Traffic Management (CAAMS) in order to ensure a smooth transition from the existing system to the new one.

2.2 China's modern air traffic management system should meet the following requirements: 1) It should be able to better plan, manage and utilize airspace resources, expand airspace capacities and meet the future needs of increasing traffic flow and high-density airport operations; 2) It should be able to enhance the system's overall support capabilities and services, ensure flight safety, improve operational efficiency and minimize flight delays; 3) It should be able to establish mechanisms of collaborative decision-making and platforms for information processing and exchange between air traffic management, airlines and airports centered around flight safety and efficiency to achieve coordinated development of air transport; and 4) It should be able to accelerate the application of new technologies in air traffic management in order to enhance the capabilities of the entire system by employing such technologies.

2.3 The CAAC Thirteenth Five-Year Development Program requires that China's air traffic management system move forward with the implementation of the Strategy for Modernizing Air Traffic Management (CAAMS) and the Performance-based Organization Strategy (PBOS). From now to 2030, the main tasks for the air traffic management system are to facilitate the implementation of the CAAMS, focusing on safety, capacity, efficiency and services, in an attempt to meet the demands for air traffic management brought about by the continuous and ever-increasing growth of air transport.

Position / Vision / Mission

Macro policies / Regulations / Operation standards



Assurance

3. FRAMEWORK OF THE SYSTEM

3.1 The top tier in the framework is the level of goals, including strategic positioning, mission and vision. The air traffic management system of China is strategically positioned as a fundamentally important strategic industry of the country that lies in the core of the support infrastructure for the safe and efficient operation of civil air transport. It constitutes an important part of the overall national communications and transport system and is an indispensable component of national air traffic control, air defense and emergency response systems. Its mission is to integrate and utilize various resources to build up an advanced and ever-improving air transport network and provide various aviation activities with safe, efficient, economical and green air navigation services on the strength of a professional work force, advanced technologies and equipment. The vision is to become a first rate air navigation service provider in the world.

3.2 The second tier down is the level of standards, including macro-policies, regulations, operation standards and specifications for strategic operations.

3.3 The third tier constitutes the nuclear core composed of overall objectives, operational concepts, service capabilities and the infrastructure, using achievement of the overall objectives as the guide, transformation of operational concepts as the driving force, enhancement of service capabilities as the means and the building of infrastructure as the handle.

3.3.1 The overall objectives cover 4 performance areas, i.e. safety, capacity, efficiency and services. In the area of safety performance, the objectives are to eliminate all aircraft accidents due to air traffic control and reduce its related incident rate per 10 thousand flights by 90% and traffic control error rate per 10 thousand flights by 20% compared with the actual safety levels of 2015. In capacity performance, the objective is to enhance flight operation assurance and support capabilities three times over the level of 2015. In efficiency performance, the objective is to limit the average flight delays due to traffic control to fewer than 5 minutes. In services performance, the objectives are to provide air transport with comprehensive, economical and predictable air navigation services, support reduction of flight operations' carbon emissions per ton/kilometer by 10% and provide flexible, facilitated and assured services for general aviation.

3.3.2 The operational concepts consist 7 aspects: airspace organization and management, traffic flow collaboration management, high density airport operations, trajectory-based operations, multiple mode separation management, civil-military joint operations and performance-based services.

3.3.3 There are 16 key service capabilities supporting the operational concepts, namely airspace organization, airspace management, traffic flow management system, high-density airports collaborative decision-making, air traffic management integration, 4D trajectory-based management, digitalized collaborative air traffic control services, traffic complexities management, civil-military traffic control convergence, services for general aviation, collaborative information environment, performance-based communications, navigation and surveillance, aviation meteorological services, aeronautical information management, safety management system and emergency disaster tolerance systems.

3.3.4 To ensure those key service capabilities, 13 infrastructure items need continuous improvement, namely air traffic control centers, traffic flow management centers, airspace management centers, airborne traffic control electronic systems, information management systems, automation

systems, communications facilities, navigation facilities, surveillance facilities, metrological facilities, aeronautical information facilities, training facilities and security facilities.

3.4 The fourth level is the support and assurance level. From 2016 to 2020, investment in building up China's modern air traffic management system will reach around RMB 20 billion yuan.

4. INTEGRAL ELEMENTS OF CHINA'S MODERN AIR TRAFFIC MANAGEMENT OPERATIONAL CONCEPTS

4.1 Airspace organization and management

4.1.1 Airspace organization involves the establishment of an airspace management system and an airspace architecture in order to meet the different needs for services of different flight activities, traffic volumes and at different levels. Whereas airspace management involves the establishment of airspace management mechanisms for the design, selection and application of specific airspace utilization programs to meet the needs of various stakeholders. The purpose is to achieve efficient use of regional or national airspace resources through scientific organization and dynamic and flexible management of air space. Different types of airspace are seen as a continuum and are allocated daily and utilized flexibly. Any necessary airspace restrictions and separation requirements are transient in nature.

4.2 Traffic flow collaboration management

4.2.1 Traffic flow collaboration management involves the establishment of multi-tier national, regional and airport-based traffic flow management systems as mechanisms for collaborative decision-making among multiple stakeholders such as air traffic control, airports and airspace users, while enhancing the capabilities for managing collaboratively traffic flows across national regions in order to strike a dynamic balance between airspace capacity and traffic demands.

4.3 High-density airport operations

4.3.1 As part of an integrated air traffic management system, airports must provide ground facilities necessary for aircraft operations, including lighting, taxiways, runways, runway thresholds and onsite precision guidance facilities so as to be able to enhance safety and maximize airport capacity in all-weather conditions. High-density airports need to increase throughput and operational efficiency through better management of arrival, departure and surface operations.

4.4 Trajectory-based operations

4.4.1 Trajectory-based operations (TBO) involve the integration of the whole process of flight planning through flight implementation centered on the 4D trajectory of the life cycle of an aircraft operation through sharing, consulting on and managing its dynamic trajectory among air traffic control, airlines and the aircraft, while using datalink technologies to achieve air-to-ground digitalized collaborative management. Compared with conventional flight operations, trajectory-based operations are capable of presenting a holistic view for trajectory planning and are more predictable to trace and easier to control precisely, featuring digitized and collaborative management, which in turn will improve the efficiency of air traffic operations and reduce the workload of air traffic controllers. By being able to foresee traffic trends for a future period, raising alerts and taking responsive actions, one can effectively ensure flight safety and efficiency.

4.5 Multiple mode separation management

4.5.1 Multiple mode separation management involves integrated use of multiple separation and conflict management techniques such as the use of strategic and tactical levels as well as concentrated and dispersed modes to prevent aircraft from coming dangerously close to or collide with one another. On the strategic level, airspace organization and management and traffic flow collaborative management will come into play to dissipate potential traffic conflicts, whereas on the tactical level, trajectory-based operations, real time traffic control commands and separation adjustments will be used to resolve short-to-mid-term flight conflicts to ensure safe separation.

4.6 Civil-military joint operations

4.6.1 The purpose is to improve efficiency in the utilization of airspace resources through flexible and effective management regimes. Unified planning, respective implementation and enhanced coordination are the key for ensuring a scientific layout of civil and military aviation infrastructure and seamless mutual communication and exchange of operational information. Civil and military joint air traffic control mechanisms will be established at busy terminal control areas to improve the performance of civil-military joint traffic control operations. Coordination on pre-tactical use of airspace will be strengthened. The civil and military sides will rely on the airspace management unit to collaboratively decide how the airspace will be used the next day and have their decision published via NOTAM or the aeronautical information network. The scope of convergent development between civil and military air traffic control departments will be expanded to increase the forms and levels of convergence. On the basis of information and systems sharing, vigorous efforts will be made to facilitate coordination in major activities, emergency response, flexible use of airspace, joint operations at busy terminal areas and other joint operational mechanisms in a bid to improve efficiency in airspace resources utilization and raise the level of civil and military collaborative operation in air traffic management.

4.7 Performance-based services

4.7.1 This concept is an off-shoot of performance-based navigation (PBN) . PBN sets out the performance requirements for precision, integrity, availability, continuity and functionality of aircraft implementing regional navigation in specified airspace. The positioning and guidance of the aircraft rely on integrated airborne, satellite-based and land-based navigation capabilities so that they can fly flexibly along any expected trajectory. Performance-based services elevate simple navigation to the high realm of air traffic management services, integrating all the performance requirements for airborne and ground systems, including required communication requirements (RCP) , required navigation performance (RNP) and required surveillance performance (RSP) , and as such, are capable of meeting the needs of different airspace users at different levels of performance requirements.